CLAIMS

1. A method of controlling fluid flow (4,6;14) in a boundary layer (8) at a fluid-surface interface (3) comprising: providing a plurality of blades (11) which project from a fluid contacting surface (3) into a boundary layer (8) such that in use the blades (11) are orientated to control fluid flow (4,6) in the boundary layer (8).

2. A method according to claim 1 wherein the blades (11) are orientated to straighten (16) the fluid flow (4,5;14).

3. A method according to either claim 1 or claim 2 wherein the blades are orientated generally aligned with the direction of fluid flow to straighten the fluid flow.

4. A method according to any of the preceding claims wherein the blades are orientated to reduce the drag or surface friction at the fluid contacting surface.

5. A method according to claim 1 wherein the blades (101) are orientated to induce turbulence or vortexes (105) in the fluid flow (103).

6. A method according to either claim 1 or claim 5 wherein the blades are orientated at an angle across the direction of fluid flow to induce turbulence or vortexes in the fluid flow.

7. A method according to any of the preceding claims in which the fluid contacting surface is that of a vehicle or fluid carrying conduit.

8. A boundary layer flow control apparatus comprising: a surface (13), over which fluid (14) can flow in a boundary layer, and a plurality of

blades (11) projecting from the surface (13), the blades (11) being configured such that in use they are capable of controlling the flow of fluid within the boundary layer.

9. A boundary layer flow control apparatus according to claim 8 in which, the blades (11) are aligned with the expected direction of the fluid flow (14), and in use are capable of straightening the fluid flow (16) in the boundary layer, thereby reducing surface friction or drag in comparison with the same surface without flow control apparatus.

10. A boundary layer flow control apparatus according to claim 8 in which the blades are orientated at an angle across the expected direction of the fluid flow, and are capable of inducing turbulence or vortexes in the fluid flow in the boundary layer in use, thereby increasing surface friction or drag in comparison with the same surface without flow control apparatus.

11. A method of controlling fluid flow according to any of claims 1 to 7, or a boundary layer flow control apparatus according to any of claims 8 to 10, in which the blades are mounted extending substantially directly away from the surface.

12. A method of controlling fluid flow according to any of claims 1 to 7, or claim 11, or a boundary layer flow control apparatus according to any of claims 8 to 11, in which the blades are at least one of the following: (a) configured as flat plate elements; (b) generally rectangular; (c) generally parallel; (d) generally of uniform height; (e) generally of uniform width; (f) generally of uniform chord; (g) generally of uniform spacing; (h) generally of uniform orientation; (i) generally uniform dimensions; or (j) dimensions vary across a surface.

13. A method of controlling fluid flow according to any of claims 1 to 7, 11 to 12, or a boundary layer flow control apparatus according to any of claims 8 to 12, in which the blades project into the boundary layer by 100 to 200 wall units.

14. A method of controlling fluid flow according to any of claims 1 to 7, or any of claims 11 to 13, or a boundary layer flow control apparatus according to any of claims 8 to 13, in which the blade orientation can be adjusted relative to the direction of fluid flow.

15. A method of controlling fluid flow according to any of claims 1 to 7, or any of claims 11 to 14, or a boundary layer flow control apparatus according to any of claims 8 to 14, in which the blades (11', 11'') are arranged as an array of multiple repeated rows (17', 29).

16. A method of controlling fluid flow according to any of claims 1 to 7, or any of claims 11 to 15, or a boundary layer flow control apparatus according to any of claims 8 to 15, in which the blades have a height, width and chord ratio of X:Y:Z wherein X is between 1 and 6, Y is between 1 and 6 and Z is between 1 and 6.

17. A method of controlling fluid flow according to claim 7 in which at least a 2%, 5%, 10% or 15% improvement in:

a) reduction of surface drag;

b) reduction of noise levels;

c) reduction of fuel consumption; or

d) increased speed;

is observed compared to a vehicle, including an aircraft, without flow manipulator blades projecting from the fluid contacting surface.

18. A surface upon which is mounted a boundary layer flow control apparatus according to any of claims 8 through 16.

19. An aircraft, with body, wing and tail sections, with boundary layer flow control apparatus as claimed in any of claims of 8 through 16 mounted upon the body, wing and/or tail section.

20. A pipe with an internal surface upon which is mounted boundary layer flow control apparatus as claimed in any of claims of 8 through 16.

21. A method of reducing the surface drag of an aircraft having an outer surface skin comprising affixing a large number, preferably at least five hundred, of flow manipulator control blades to the surface skin, the blades being aligned with the expected direction of fluid flow past the aircraft skin.

22. A method of reducing the surface drag in a pipe or conduit having an inner surface comprising affixing flow manipulator control blades to the inner surface, the blades being aligned with the expected direction of fluid flow past the surface.